



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8

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JUN 27 2019

Ref: 8WD-CW-W

Jason Thomas
Wyoming Department of Environmental Quality
Water Quality Division (WDEQ/WQD)
200 West 17th Street
Cheyenne, Wyoming 82002

RE: Renewal of the Aethon Energy Operating LLC -WY0002062

Dear Mr. Thomas:

Thank you for providing the EPA Region 8 with a copy of the proposed Aethon Energy Operating LLC permit. This letter provides our comments on the proposed permit and statement of basis (SoB). For your convenience we have listed summaries of the significant comments that should be addressed before finalizing the permit. Additional details are included in the attachment.

1. **Effluent Limit Issues:** Section 301(b) of the Clean Water Act requires that NPDES permits include technology-based effluent limits (TBELs) based on the best available technology as identified by the EPA, and any more stringent water quality-based effluent limits (WQBELs) necessary to protect applicable water quality standards.

The permit lacks clarity as to how the TBELs it includes were developed and contains no analysis as to whether they comply with the applicable federal effluent limitation guideline. WDEQ Water Quality Rules and Regulations, Chapter 2, Appendix H, provides for technology-based effluent limits of 2000 mg/L for chloride and 5000 mg/L for TDS. The proposed permit effluent limits for chloride and TDS are 2419 mg/L and 6400 mg/L, respectively. Effluent limits above those proscribed in Appendix H may be allowable under state law. However, additional analysis is needed to determine if these increased effluent limits meet the federal requirements at 40 C.F.R. 435, Subpart E.

NPDES permits must include WQBELs for all pollutants or pollutant parameters which the Director determines will cause, have the reasonable potential to cause, or contribute to a violation of any State water quality standard. 40 C.F.R. § 122.44(d)(1)(i). It is unclear based on the SoB whether WDEQ completed such an analysis. WDEQ should complete or make clear its reasonable potential (RP) analyses for pollutants associated with Aethon's discharge for all designated uses, water quality criteria, and antidegradation requirements in Alkali Creek, Badwater Creek, and Boysen Reservoir in developing effluent limits for this permit.

2. **Demonstration of a Tier 2 Antidegradation Review for Badwater Creek and Boysen Reservoir:** Antidegradation is a component of water quality standards and, consequently, antidegradation-based effluent limits are a specific type of WQBEL. Wyoming's *Antidegradation Implementation Policy* (current version dated 2013) for Class 2AB, 2A, 2B and 2C waters – classes of waters that include Badwater Creek and Boysen Reservoir – requires that the State determine whether proposed new or increased discharges will result in significant degradation to the receiving waters. Specifically, under WDEQ's Tier 2 anti-degradation policy, degradation is considered not to be significant if the new or increased loading is less than or equal to 10% of existing total load *or* the new or increased loading is less than or equal to 20% of assimilative capacity in terms of concentration. If the degradation is determined to be significant, WDEQ must complete an economic evaluation and alternatives analysis, which should be included in the public notice process for this permit.
3. **Demonstration of Antidegradation Protection for Class 1 Wind River Segment:** For the antidegradation review of the Wind River, WDEQ is implementing a 2007 *Interim Policy on Establishing Effluent Limits for Permitted Point Source Discharges to Class 1 Water Tributaries*. This policy is not included in the state's publicly available *Antidegradation Implementation Policy* previously reviewed by EPA. EPA was unaware of the 2007 policy prior to the drafting of this permit, and, to EPA's knowledge, it has never been subject to public notice or review. The policy provides guidance in setting effluent limits for discharges to tributaries to Class 1 waters and options to allow for increased point source loading to these tributaries. However, the resulting effluent limits in the permit may result in "significant" degradation to water quality in the Wind River (as defined under WDEQ's Tier 2 policy) which may not meet the State's antidegradation rules for Class I waters.
4. **Discharge of Other Fluids:** Page one of the SoB states, "The permit authorizes the discharge of produced water from conventional oil and/or gas facilities to waters of the state if the effluent quality complies with effluent limits established by this permit. This permit does not cover activities associated with discharges of drilling fluids, acids, stimulation waters or other fluids derived from drilling or completion of wells." Neither the permit nor the SoB explain how these fluids will be managed so that they are not discharged.
5. **Impaired Waters Not Included on Wyoming's 303(d) List:** On page 12 of the SoB under the *Antidegradation, impairment review* heading, WDEQ states "In addition, an evaluation of the receiving waters revealed that they are not on the 303(d) list as waterbodies that cannot support designated uses." The EPA notes that monitoring data suggest that a number of waters impacted by the discharge are not meeting their water quality standards, and that the absence of a water on the section 303(d) list, including Badwater Creek, does not by itself support an inference that a particular water is supporting its designated uses. A more thorough review of available information indicating whether uses are being obtained is important information for the public in reviewing this permit and for WDEQ when determining effluent limits and other permit conditions.

6. **Whole Effluent Toxicity (WET) Requirements:** The narrative effluent limitation in the permit is not clear and WET would be difficult to enforce. The permit should further specify test requirements, such as: renewal frequency, test temperature, dilution series required, dilution water to be utilized.
7. **Factual Errors and Clarity Issues:** There are several areas in the SoB which are either unclear or inaccurate and require correction.

WDEQ has received significant public comment on this permit through the public notice process, including comments received at public hearings held in May 2019 in Riverton and Thermopolis. As a result, the EPA is requesting that WDEQ transmit the final permit for our review in accordance with 40 C.F.R. § 123.44(j). Again, thank you for the opportunity to comment on this permit. If you have any questions concerning the above, please contact Qian Zhang of my staff at (303) 312-6267.

Sincerely,

A handwritten signature in black ink, appearing to read 'Darcy O'Connor', with a long horizontal line extending to the right.

Darcy O'Connor, Director
Water Division

Enclosure: Detailed Comments on the proposed Aethon Energy Operating LLC permit

cc: Bill DiRienzo, WDEQ

EPA Detailed Comments on Proposed NPDES Permit Renewal for Aethon Energy Operating LLC -WY0002062

1. **Effluent Limit Issues:** Section 301(a) of the Clean Water Act (CWA) prohibits the discharge of any pollutant by any person except when authorized under the Act. Section 402(a) of the CWA authorizes EPA to issue National Pollutant Discharge Elimination System (NPDES) permits that allow the permit holder to discharge pollutants subject to limits, including effluent limitations. Section 402(b) subsequently authorizes EPA to allow a state to administer the NPDES program if the state demonstrates adequate authority to do so. Section 301(b) establishes the minimum effluent limitations required for both EPA-issued and state-issued NPDES permits. Such permits must contain technology-based effluent limitations (“TBELs”) reflecting specified levels of control, CWA § 301(b)(1)(A)-(B), and any more stringent water quality-based effluent limitations (“WQBELs”) necessary to meet water quality standards, CWA § 301(b)(1)(C). The distinction between TBELs and WQBELs is an important one, as there are certain statutory and regulatory requirements specific to the two different kinds of effluent limitations.

Section 301(b)(1)(A) requires point sources to achieve TBELs that the EPA establishes pursuant to CWA § 304(b). These TBELs are called effluent limitation guidelines (ELGs), and the EPA publishes them for different classes and categories of point sources. If the EPA has published an ELG for a particular industry, Section 301(b)(1)(A) requires the effluent limits it contains to be incorporated into any NPDES permit issued to a point source that is part of that industry. In 1979, the EPA promulgated ELGs for the point sources in the oil and gas industry operating west of the 98th Meridian: 40 C.F.R. Part 435, Subpart E – Agricultural and Wildlife Water Use Subcategory (generally, “Subpart E”). 44 Fed. Reg. 22069 (April 13, 1979). Subpart E provides that produced water from such facilities may be discharged only if it is: 1) of good enough quality to be used for wildlife or livestock watering or other agricultural uses; and 2) it is actually put to that use. 40 CFR § 435.50. Wyoming is located west of the 98th Meridian and thus oil and gas point sources in the State are subject to Subpart E. Pursuant to Section 301(b)(1)(A) of the CWA, and 40 C.F.R. § 125.3(a)(2)(i)(C), all permittees must meet all TBELs upon the date of permit issuance.

Section 301(b)(1)(C) requires that permits include “any more stringent limitation, including those necessary to meet water quality standards, treatment standards, or schedules of compliance, established pursuant to any State law or regulations, . . . or required to implement any applicable water quality standards established pursuant to this chapter.” These WQBELs are included in a permit if “any more stringent limitation” beyond the applicable TBELs is required to protect an applicable water quality standard. The EPA has codified this requirement into its regulations at 40 C.F.R. § 122.44(d)(1). Under this regulation, all EPA-issued and state-issued NPDES permits must control all pollutants or pollutant parameters which the Director determines will cause, have the reasonable potential to cause, or contribute to a violation of any State water quality standard. 40 C.F.R. § 122.44(d)(1)(i).

To determine whether a discharge has reasonable potential (RP) per 40 CFR 122.44(d)(1)(i), the permitting authority must “use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water.” 40 C.F.R. § 122.44(d)(1)(ii). When the permitting authority determines that a discharge has the RP to cause, or contribute, to an exceedance of a numeric criterion within a State water quality standard for a particular pollutant, the permit must contain effluent limits for that pollutant. 40 C.F.R. § 122.44(d)(1)(iii). Generally, pursuant to Section 301(b)(1)(C) of the CWA, the permittee must meet all WQBELs upon the date of permit issuance. However, if a state has adopted, and the EPA has approved, a compliance schedule authorizing provision pursuant to 40 C.F.R. § 131.15, then a state may issue a compliance schedule for a WQBEL under 40 C.F.R. § 122.47. With these basic precepts in mind, the EPA provides the following comments on the TBELs and WQBELs included in the Aethon permit:

Technology-Based Effluent Limit Issues

WDEQ Water Quality Rules and Regulations, Chapter 2, Appendix H, establishes technology based effluent limits for produced water discharges from oil and gas production facilities. Paragraph (b)(vii) of Appendix H establishes effluent limitations for all permits of produced water discharges from oil and gas production facilities, including limits of 2000 mg/L for chloride and 5000 mg/L for TDS, which Appendix H states are protective for livestock and wildlife consumption. The proposed permit includes effluent limits of 2419 mg/L for chloride and 6400 mg/L for TDS.

Paragraph (c) of Appendix H allows chloride and TDS concentrations to be modified for permits where the original permit application was submitted prior to September 5, 1978, and one of the following is provided: 1) a signed "letter of beneficial use" from a land owner, 2) a signed statement by the Wyoming Game and Fish Department detailing value to fish or wildlife, or 3) documentation by the owner or operator of the discharging facility of extenuating circumstances justifying the modification.

The Statement of Basis (SoB) asserts both that “Chloride and TDS were established based on historic grandfathered discharge concentrations” (p. 4) and that “The Wyoming Game and Fish Department determined that discharge of produced water from all existing WYPDES permitted oil production units in Wyoming enhances wildlife propagation and habitat” (p. 9). It is not possible to ascertain from these two statements whether WDEQ is appropriately applying the criteria in Appendix H to establish the modified chloride and TDS effluent limits. The EPA recommends explaining the relationship between permit limit modifications under Appendix H and historic grandfathering referenced in the SoB. Additionally, please explain whether outfalls 001-016 were all part of the original permit pre-1978 application that is being grandfathered, or whether the grandfathering is being extended to new outfalls. Finally, a copy of the signed statement from Wyoming Game and Fish Department detailing the value of the discharge to fish or wildlife that is required by Appendix H, paragraph (c) should be included in the permit record.

Even if the State has concluded that a discharge from an oil and gas production facility qualifies for modification (or grandfathering) of the TBELs contained in paragraph (b)(vii), the State is still required to demonstrate that the modified limits comply with the requirements of 40 C.F.R. Part 435, Subpart E. As described above, under these rules produced water may be discharged from onshore facilities west of the 98th meridian for which “the produced water has a use in agriculture or wildlife propagation”. The regulation states that the term “use in agricultural or wildlife propagation” means that the produced water is of good enough quality to be used for wildlife or livestock watering or other agricultural uses and that the produced water is actually put to such use during periods of discharge.” Thus, please provide the analysis the State conducted to conclude the produced water is of good enough quality for such use in agricultural or wildlife propagation.

Additionally, it appears that the modified (or grandfathered) chloride and TDS limits are based on flow-weighted monthly average concentration. It is unclear how the flow-weighted monthly average concentration was developed. It would be helpful for the EPA and the public if an example of the flow-weighted monthly average concentration calculation were provided.

Water Quality-Based Effluent Limit Issues

As described above, Section 301(b)(1)(C) of the CWA requires that permits include “any more stringent limitation, including those necessary to meet water quality standards, treatment standards, or schedules of compliance, established pursuant to any State law or regulations . . . or required to implement any applicable water quality standards established pursuant to this chapter.” This requirement has been incorporated into EPA’s permitting regulations requiring that all NPDES permits must control “all pollutants or pollutant parameters...which the Director determines will cause, have the reasonable potential to cause, or contribute to a violation of *any* State water quality standard.” 40 C.F.R. § 122.44(d)(1)(i) (emphasis added). These rules require that NPDES permits must ensure compliance with all water quality standards that are affected by a discharge.

It is unclear whether WDEQ completed such a RP analysis under 40 C.F.R. § 122.44(d)(1)(ii) for all downstream receiving waters when it developed the effluent limits included in this permit. The EPA requests that WDEQ complete and make public its RP analyses for pollutants associated with Aethon’s discharge for all designated uses, water quality criteria, and antidegradation requirements that apply to its receiving waters, including Alkali Creek and its tributaries, Badwater Creek, and Boysen Reservoir.

- a. The SoB focuses primarily on attainment of the antidegradation Class 1 requirements of the Wind River and does not clearly demonstrate the uses and criteria in the Alkali Creek watershed, Badwater Creek, and Boysen Reservoir are fully considered and protected.

Page 8 of the SoB states that WDEQ is using a “mixing zone approach” to measure effects at the confluence of Badwater Creek and Boysen Reservoir. The SoB further states:

- “This is not a conventional mixing zone since the discharge facility is located approximately 40 stream miles up from this confluence.”
- “[C]omplete mixing occurs, even under low natural flow conditions in Badwater Creek.”
- “The mixing area is estimated to be approximately 330 feet long east to west, and 730 feet wide, north to south. The location of this mixing area is at the far east end of Badwater Bay, right at the mouth of Badwater Creek.”

Mixing zones are authorized under Chapter 1, Section 9 of the Wyoming Water Quality Standards. This regulation provides:

“[C]ompliance with water quality standards shall be determined after allowing reasonable time for mixing. Except for the zone of initial dilution, which is the initial 10% of the mixing zone, the mixing zone shall not contain pollutant concentrations that exceed the aquatic life acute values (see Appendix B). In addition, there shall be a zone of passage around the mixing zone which shall not contain pollutant concentrations that exceed the aquatic life chronic values (see Appendix B) . . . The procedures used to implement this section are described in the Mixing Zones and Dilution Allowances Implementation Policy.”

Please explain how Chapter 1, Section 9 authorizes a 5.5 acre mixing zone located 40 stream miles from the point of discharge, and what factors the State considered when concluding that this constituted a “reasonable time for mixing.” Please explain how the establishment of this mixing zone comports with Section 3(a) of the State’s mixing zone policy, which limits mixing zones to instances in which there “is near instantaneous and complete mixing of the discharge with the receiving water at critical conditions.”

- b. WDEQ excludes discussion of attainment and protection of all State adopted designated uses and instead only focuses on existing uses. On page 9 of the SoB, WDEQ states that there is no “existing drinking water use for Badwater Creek” possibly implying that the drinking water use does not need to be considered in the RP analysis. While there may be no existing use at this time, all designated and federally approved uses must be considered and protected. WDEQ may embark on a process to change uses if appropriate but cannot ignore this or other components of approved water quality standards without a rulemaking and approval from the EPA.

- c. Badwater Creek is designated by the State as a Class 2AB cold-water fishery. Per Wyoming water quality standards (Chapter 1, Section 25(b)), “[w]hen ambient temperatures are above 60 degrees Fahrenheit...pollution attributable to the activities of man shall not result in an increase of more than 2° F in existing temperatures.” The EPA recognizes that temperature monitoring has been included in the permit; however, it is reasonable to expect that because of the elevated discharge temperature (greater than 90° F), high volume of the discharge (greater than 4 million gallons per day (MGD)), and limited volume of instream dilution, that there is RP to exceed Wyoming’s temperature standard in Badwater Creek. The EPA would expect an RP analysis using all available data such as data collected as part of the 2010 to 2016 field collection efforts supporting the Generalized Environmental Modeling System for Surface Water (GEMSS) modeling or other agency data. Alternatively, if data have been sought but are not available, the EPA recommends that temperature modeling be performed to estimate potential impacts and impairments.
- d. This permit focuses on persistent pollutants that may reach the Wind River but does not clearly demonstrate that RP analysis was performed on non-persistent pollutants that may impact segments proximal to the discharge location. For example, WDEQ did not describe an RP analysis of the potential impact of up to a maximum of 8.27 MGD of produced water discharge containing Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) compounds into Badwater Creek and Boysen Reservoir. Both of these water bodies have designated drinking water and aquatic life uses, and each of the BTEX compounds has, at a minimum, a fish and drinking water consumption criterion. When a receiving water has an applicable water quality standard for a pollutant that is present in a discharge, the state must conduct an RP analysis under 40 C.F.R. § 122.44(d)(1)(ii).

As another example, on page 5 of the SoB, WDEQ states “...a separate confirmation was done for oil and grease showing that oil and grease concentrations downstream of the Boysen Dam are well below the 10 mg/L industry standard.” No such analysis or statements were provided for Alkali Creek, Badwater Creek, or Boysen Reservoir. The SoB should clearly describe such analyses for non-persistent pollutants.

- 2. **Demonstration of Tier 2 Antidegradation Review for Badwater Creek and Boysen Reservoir:** Wyoming’s *Antidegradation Implementation Policy* (current version dated 2013) for Class 2AB, 2A, 2B and 2C waters – classes of waters that include Badwater Creek and Boysen Reservoir – requires that the State determine whether proposed new or increased discharges result in significant degradation to the receiving waters. If the degradation is determined to be significant, WDEQ must complete an economic evaluation and alternatives analysis, which should be included in the public notice process for this permit.

Under WDEQ’s Tier 2 antidegradation policy, degradation is considered to be not significant if the new or increased loading is less than or equal to 10% of existing total load **OR** the new or increased loading is less than or equal to 20% of assimilative capacity in terms of concentration. There are two other factors that could lead to an activity to not be considered significant; these do not appear applicable. One is if it can be permitted under a general permit and the second is if it will result in only temporary or short-term changes in water quality (WDEQ *Antidegradation*

Implementation Policy, p. 9). The discharge is not being permitted with a general permit nor are its impacts temporary or short-term. WDEQ either did not complete or did not document the load or concentration-based first step required for a Tier 2 antidegradation review of Badwater Creek and Boysen Reservoir.

- a. Badwater Creek –No quantitative analysis regarding the percent increase of existing total load nor percent change in assimilative capacity was provided for this waterbody. Such analysis would likely show greater than 10% increase in load to Badwater Creek or a 20% consumption of assimilative capacity for some parameters, possibly triggering the need for an economic and alternatives analysis. In addition, such an analysis may show exceedances of water quality criteria in Badwater Creek, meaning there is no assimilative capacity. WDEQ must complete the Tier 2 antidegradation review for Badwater Creek and take the appropriate next steps if the analysis indicates significant degradation per State regulation and policy.
 - b. Boysen Reservoir – On page 10 of the SoB, WDEQ states “No pollutants from this facility are expected to result in mixed concentrations that consume 20% or more of the available assimilative capacity within the lake. Therefore, WDEQ’s review has concluded that continued discharges from this facility will not result in significant degradation of Boysen Reservoir.” The analysis supporting this conclusion was not included in the SoB and should be included in the permit record.
3. **Demonstration of Antidegradation Protection for Class 1 Wind River Segment:** WY’s water quality standards for Class 1 waters state, “no existing point sources, other than dams, may increase their quantity of pollution discharge, to any water designated as Class 1.” Also, “[t]he department shall impose whatever controls and monitoring are necessary on point source discharges to Class 1 waters and their tributaries to ensure that the existing quality and uses of the Class 1 water are protected and maintained (Chapter 1, Section 7).”

For the Aethon permit, WDEQ states that it is implementing a 2007 *Interim Policy on Establishing Effluent Limits for Permitted Point Source Discharges to Class 1 Water Tributaries* in its antidegradation review of the Wind River, which is a Class 1 water. This policy is not included in the state’s publicly available *Antidegradation Implementation Policy*. The EPA was unaware of it prior to the drafting of this permit, and, to the EPA’s knowledge, it has never been subject to public notice or review. The policy provides guidance in setting effluent limits for discharges to tributaries to Class 1 waters and options to allow for increased point source loading to these tributaries.

WDEQ has interpreted this interim policy to allow increases in discharge loads in tributaries when such discharges cause no more than 10% or 1 standard deviation (SD) change in the downstream Class 1 water quality.

The interim policy directs permits to be written to an average condition and describes the average plus 10% or 1 SD as options to **evaluate monitoring data to determine whether a measurable lowering has occurred**. The interim policy specifies:

This concept of measurable lowering will only apply when the Department conducts evaluations to ensure there has not been more than a 10% or 1 standard deviation adverse departure from the average background conditions on the Class 1 water after the approval date of this policy. Under no circumstances does measurable lowering constitute a 10% or 1 standard deviation allowable degradation to the average background conditions of the Class 1 water. Rather, 10% or 1 standard deviation is considered the trigger level at which a real adverse departure (and not a departure due to natural variability) is detectable (p. 4).

- a. The interim policy as applied in the Aethon permit appears to be inconsistent with the federal requirements and Wyoming's antidegradation implementation policy reviewed by the EPA and the public and Wyoming's regulations at Chapter 1, Sections 4(a) and 7.
- b. The EPA believes that by setting the effluent limit to affect an average concentration increase up to 1 SD in the Wind River, WDEQ is authorizing a water quality change from historic conditions rather than preventing it. This approach establishes a new higher concentration average baseline condition for the Wind River. WDEQ's interpretation of its policy in this permit results in increased loads of chloride, TDS, and all other effluent constituents to the Wind River. The increased loads and concentrations will result in an estimated 88% load increase in chloride in the Wind River under this permit. The proposed effluent limit results in degradation that could be considered significant even for a Tier 2 water, in which some degradation is allowed. See comment 2. WDEQ's interpretation of this policy seems to provide less protection and public process for its Class 1 waters than those in lower tiers.
- c. WDEQ should implement its antidegradation policy to ensure no degradation to the Wind River, a Class 1 Outstanding Water, by, at a minimum, establishing permit limits that protect the average historic water quality concentrations.

4. **Discharge of Other Fluids:** Page one of the SoB states, “The permit authorizes the discharge of produced water from conventional oil and/or gas facilities to waters of the state if the effluent quality complies with effluent limits established by this permit. This permit does not cover activities associated with discharges of drilling fluids, acids, stimulation waters or other fluids derived from drilling or completion of wells”. The use of the phrase “does not cover” could be interpreted to mean that such discharges are merely not being addressed by this permit even though these fluids will be generated and require management.

In Frac Focus, a hydraulic fracturing chemical registry, the permittee reported that 15 production wells were stimulated from 2016-2017 using a variety of breakers, surfactants, gelling agents and demulsifiers. Research has shown that produced water, like flowback water, contains additives used during stimulation and maintenance processes.¹²³⁴⁵ The permit does not address whether segregation of the flowback is required. If segregation is required, when does the segregation cease and the facility return the production wells to normal operation and discharge of produced water commences? The EPA recommends clarifying how these activities and discharges are being addressed under this permit, and if they are prohibited. If flowback is allowed to be discharged, please explain how the permit is ensuring compliance with WDEQ’s WQS and the effluent limitation guideline at 40 C.F.R. Part 435, Subpart E.

Appendix J of the Moneta Divide Natural Gas and Oil Development Project EIS (which covers Aethon’s projected development) contains numerous hazardous substances that will be potentially used or produced during construction, production and reclamation operations. Many of these hazardous substances are proposed to be utilized for maintenance and therefore will also be part of the regular produced water discharge. Because of the inconsistent nature of the composition of produced water through time, monitoring annually using Whole Effluent Toxicity (WET) testing is not sufficient to comprehensively identify all potential toxic effects.

¹ Oetjen, K.; Giddings, C.G.S.; McLaughlin, M.; Nell, M.; Blotevogel, J.; Helbling, D.E.; Mueller, D.; Higgins, C.P.; 2017. Emerging analytical methods for the characterization and quantification of organic contaminants in flowback and produced water. Trends in Environmental Analytical Chemistry, v. 15, p. 12-23. <https://doi.org/10.1016/j.teac.2017.07.002>

² Orem, W.; Tatu, C.; Varonka, M.; Lerch, H.; Bates, A.; Engle, M.; Crosby, L.; McIntosh, J.; 2014. Organic substances in produced and formation water from unconventional natural gas extraction in coal and shale. International Journal of Coal Geology, v. 126, p. 20-31. <http://dx.doi.org/10.1016/j.coal.2014.01.003>

³ Rosenblum, J.; Nelson, A.W.; Ruyle, B.; Schultz, M.K.; Ryan, J.N.; Linden, K.G.; 2017. Temporal characterization of flowback and produced water quality from a hydraulically fractured oil and gas well. Science of the Total Environment, v. 596-597, p. 369-377. <https://doi.org/10.1016/j.scitotenv.2017.03.294>

⁴ Rosenblum, J.; Thurman, E.M.; Ferrer, I.; Aiken, G.; Linden, K.G.; 2017. Organic chemical characterization and mass balance of a hydraulically fractured well: from fracturing fluid to produced water over 405 days. Environmental Science & Technology, v. 51, p. 14006-14015. DOI: 10.1021/acs.est.7b03362

⁵ Thurman, E.M.; Ferrer, I.; Rosenblum, J.; Linden, K.; Ryan, J.N.; 2017. Identification of polypropylene glycols and polyethylene glycol carboxylates in flowback and produced water from hydraulic fracturing. Journal of Hazardous Materials, v. 323, part A, p. 11-17. <https://doi.org/10.1016/j.jhazmat.2016.02.041>

Impaired Waters Not Included on Wyoming's 303(d) List: On page 12 of the SoB under the *Antidegradation, impairment review* heading, WDEQ states "In addition, an evaluation of the receiving waters revealed that they are not on the 303(d) list as waterbodies that cannot support designated uses." While this is an accurate statement, for the reasons described below WDEQ cannot rely on review of the 303(d) list to be confident that impairments do not exist in the waterbody segments affected by this permit.

- a. The EPA notes that while Badwater Creek does not appear on the State's section 303(d) list, this does not necessarily support an inference that the stream can support all its designated uses. It is true that particular waters may not appear on the section 303(d) list because they are meeting their water quality standards, but they may also not appear on the section 303(d) list because they have never been assessed by the State. In previous Integrated Reports, WDEQ reported that this waterbody could not be assessed due to lack of data. Hence, the WDEQ should remove the reference to the section 303(d) list as the sole means of determining if a segment is impaired. Inferences regarding the impairment status of Badwater Creek and other segments that are not on the 303(d) list should be based on data analysis and/or modeling.
 - b. The table provided in the SoB on page 3 reveals that Wind River may be impaired for copper, cadmium, and possibly pH when comparing average values and maximum values in this table to chronic or acute water quality criteria. Wind River is not listed as impaired on the 303(d) list. The EPA requests that WDEQ make clear the current attainment status of Wind River for these and other pollutants listed on page 3 of the SoB. A more thorough review of available information indicating whether uses are being obtained is important information for the public in reviewing this permit and for WDEQ when determining effluent limits and other permit conditions.
5. **Whole Effluent Toxicity (WET) requirements:** The narrative WET effluent limitation in the permit reads, "...there shall be no chronic or acute toxicity in any outfalls at this facility." The permit does not identify test endpoints or what is considered failure, making the limit difficult to enforce. Further, the permit specifies that the WET sample is a flow-weighted composite from all outfalls, which seems in conflict with the statement that there be no toxicity "in any outfalls."

The limited information provided in the SoB does not explain the rationale for the WET testing regimen. Based on the facility flows specified in the range of 1-4 MGD, the expected variability of chemicals in the discharge from well maintenance, and the "outstanding water resource" designation, a monthly WET testing limitation on two sensitive species (e.g. *Ceriodaphnia dubia* and *Promelas pimephales*) is warranted. To ensure the test is run consistently and is representative of existing conditions in stream, the permit must specify test requirements to be used by the lab such as: renewal frequency, test temperature, dilution series required, and dilution water and hardness.⁶

⁶ Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, Fourth Edition, August 1993, EPA/600/4-90/027F (acute method manual); Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Third Edition, July 1994, EPA/600/4-91/002 (freshwater chronic method manual); and Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms, Second Edition, July 1994, EPA/600/4-91/003 (marine chronic method manual).

Additionally, the SoB does not support or justify the proposed use of the less sensitive species, *Daphnia magna*. Alterations of the WET testing requirements are only allowed where a chemical specific limitation is put in a permit as required by 40 C.F.R 122.44 (d)(1)(v).

The use of acute and chronic WET test methods for differing species is not explained in the SoB. It appears that acute testing is only specified for the *Daphnia magna* species, and chronic testing is specified for the *Pimephales promelas*. This testing regimen will not provide the required chronic data for the invertebrate species. Additionally, the SoB incorrectly references the use of the acute test manual in the chronic language section.

Language in the permit and SoB for follow up testing and Toxicity Identification Evaluation and Toxicity Reduction Evaluation (TIE/TRE) requirements should include a schedule of events and timelines for completion; the requirement "implemented on a schedule established by WDEQ" could cause prolonged delays and enforcement issues. EPA recommends that a TIE/TRE should begin within 1 month and should not exceed 6 months.

Reference to the "Region VIII Guidance for Chronic Whole Effluent Reporting" and "Region VIII EPA NPDES Acute Test Conditions – Static Renewal Whole Effluent Toxicity Tests" are outdated and should be updated to require the "R8 WET Toxicity Test Report Format" as specified in the Report Preparation and Test Review section of the EPA WET test manuals.

6. **Factual Errors and Clarity Issues:** There are several areas in the SoB which are either unclear or inaccurate and require correction, including the following:

- a. The SoB refers to a variety of potential discharge rates. Page 2 states, "Projected discharge rates for the next permit term are around 4.37 MGD combined (treated + untreated)." Page 5 includes a table contemplating total discharge rates of 2.86 MGD, 4.37 MGD and 8.27 MGD. It is unclear what WDEQ's intent is for including this range of flow information in the SoB. It is our understanding that the modeling used to establish the effluent limits for this permit was based on a discharge rate of up to 4.37 MGD. Is that correct and is the volume of discharge capped at this level under this permit? Are there plans to discharge larger volumes under this permit or in the future? How will the increased discharge volumes impact the RP analysis and effluent limits? Where and how will the increased RO concentrate be disposed? We suggest that WDEQ clarify its process for determining the allowable discharge volume from this facility and its conclusions regarding allowable flow.

It is our understanding that in the past excessive erosion has occurred when discharges from this facility reached 3 MGD. As noted above, the permit seems to suggest that discharge rates may vary between 2.86 MGD and 8.27 MGD. Page 13 of the SoB states "erosion control measures will be implemented to prevent significant damage to or erosion of the receiving water channel at the point of discharge." To be effectively implemented, the EPA recommends the permit include the specific measures to be implemented and the SoB describe how those measures protect for the range of flows referenced in the document. Erosion at locations other than the point of discharge should be considered as well as potential mitigation.

- b. On page 2 of the SoB, WDEQ states “All blending of treated and untreated waters happens within the project area.” Please geographically define the project area and area where blending occurs. Is the extent of Alkali Creek and Badwater Creek included in this area?
- c. Page 6 of the SoB states “Hardness values were lower in Aethon’s discharge, on average, than in Wind River below Boysen, so as a conservative approach, hardness-based criteria were calculated for the greater hardness value at Wind River below Boysen Reservoir.” This is an inaccurate statement. Hardness affects the toxicity of metals, and it is an inverse relationship. As hardness increases, the toxicity of constituents with hardness-based criteria decreases and, consequently, the criteria allow for higher levels of these toxic constituents. A conservative approach would be to use the lower hardness value in Aethon’s discharge rather than the higher value in the Wind River, leading to lower allowable levels of these toxic constituents.
- d. On page 4 of the permit, the chloride load unit should be tons/month. On page 16, for discharge point BWC1, the latitude and longitude location are by Bridger Creek, which is north of Badwater Creek. This location is not below the Alkali Creek confluence with Badwater Creek. WDEQ should verify the accuracy of location data for the rest of discharge points.